



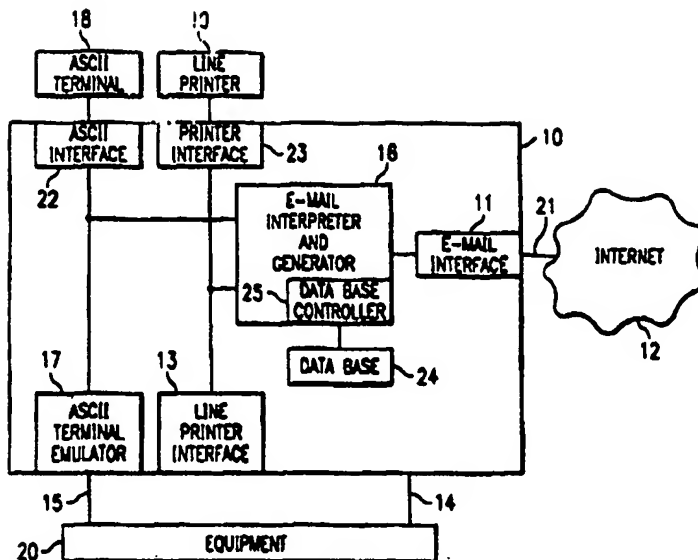
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(54) Title: INTELLIGENT E-MAIL INTERFACE

(57) Abstract

The invention is an interface device that is either integral or peripheral to equipment that requires monitoring and maintenance. The equipment may be a PBX or ACD, but may also include any type of equipment that requires monitoring and/or maintenance. The interface device converts the output from the equipment to e-mail messages that are sent to the technician at a remote location, and converts e-mail instructions from the technician that are received at the interface device to ASCII terminal keystrokes that the PBX receives and understands. The interface can broadcast multiple error messages to multiple recipients. The interface device allows multiple technicians simultaneous access to the equipment. The interface devices provide enhanced access security to the equipment.



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INTELLIGENT E-MAIL INTERFACE

TECHNICAL FIELD OF THE INVENTION

This invention relates in general to hardware interfaces and in particular to a smart internet interface for telephone switching equipment status reporting and control.

BACKGROUND OF THE INVENTION

Standard telephone switching equipment like a private branch exchange (PBX) or an automatic call distributor (ACD), typically are equipped with two (2) standard interfaces. One interface would be a
5 standard line printer interface, which is used for the piece of equipment to log error conditions and changes in status and changes in configuration. A second standard interface on most equipment is an ASCII dumb terminal interface to drive a VT 100 style dumb terminal which a technician can use to query an error buffer and also to make changes in the configuration of
10 the system to take on line or off line certain functionalities in the switch.

The main problem with the standard equipment is that all checking and testing must be done locally. In order for a technician to even query an internal buffer or to read the printer output, the technician must physically be present at the same location as the PBX or the ACD. This
15 co-location requirement causes a time problem in that the technicians may be geographically scattered from the equipment that they maintain, and time is lost relocating to the equipment site.

Two known solutions to this problem is to have either an on-site technician permanently assigned to monitor the equipment, or have a
20 visiting technician that makes periodic inspections on a routine basis to check for errors and make configuration changes. The problem with the former solution is that it is expensive to retain personnel for that purpose. The problem with the latter solution is that the technician will most likely

be absent when the equipment suffers a breakdown or other serious problem. Another drawback to the latter solution is that the technician may be busy or otherwise involved at another equipment site, and thus, unable to respond to the equipment problem.

5 Some PBXs or ACDs may be equipped with another type of interface. This interface is a link to the telephone system through a single modem. Current technology usually has only has one telephone line for remote maintenance. So, if one technician is already connected to the equipment or PBX through that one single modem, a second technician
10 that needs to perform a different operation, perhaps a software upgrade or a reconfiguration of resource, cannot access the PBX until the first technician is done. Moreover, this type of telephone interface is 'passive' in that it does not seek out the technician when a problem arises, but rather waits until the technician dials into the equipment.

15 A major problem in the current technology with using the telephone interface is the lack of security. As the telephone interface is passive, it does not perform any kind of caller authentication or security screening on incoming calls. Thus, individuals known as 'hackers' take advantage of this weakness in the system and break into the PBX system. Once inside,
20 the hackers may change codes in the switching PBX, thus allowing them to make illegal long distance phone calls. Even worse, the hackers may attempt to sabotage the system by inserting a virus or deleting important system files.

SUMMARY OF THE INVENTION

The above, and other needs, are met by the use of the inventive intelligent interface. The invention allows a technician to remotely query the PBX or ACD, as if the technician is using the co-located ASCII dumb terminal that is located at the same place as the ACD or the PBX. Moreover, the invention allows the technician to perform this function via the internet. Thus, the technician can, at any place that allows for an internet connection, read what would be outputted on the printer at the PBX. The technician can send commands to the equipment and receive responses from the equipment as if the technician were at the local ASCII terminal.

Application Serial No. 08/805,289, filed concurrently herewith, having a common assignee, entitled E-MAIL SERVER FOR MESSAGE FILTERING AND ROUTING, by Robert H. Frantz, is hereby incorporated by reference herein.

The invention is an interface device, which could be integral or attached to the equipment. The equipment may be a PBX or ACD, but may also include any type of equipment that requires monitoring and/or maintenance. These types of equipment may include, but is not limited by, the following: other telecommunications apparatus, a security/alarm system, a safety system that monitors detectors for fire, carbon monoxide, radon, poison gases, and/or water leakage, a vending machine that monitors the number of products and their expiration dates, a photocopier

that monitors the amount of toner and paper, a home-type appliance such as a refrigerator or washing machine, a weather alert system, a lighting system, a computer, a printer, a vehicle, a personal monitoring system that monitors the health and/or location of a person and a building environmental control system.

The inventive interface could emulate a printer interface and/or an ASCII dumb terminal interface to the PBX. The interface would include an internet e-mail massaging capability that is connected to the public telephone network via an analog or a digital telephone line. By using a series of interactions of sending and receiving e-mails, the inventive interface device allows for communication between the PBX equipment and the remotely located technician.

The interface device converts the output from the PBX equipment to e-mail messages that are sent to the technician at a remote location, and converts e-mail instructions from the technician that are received at the interface device to ASCII dumb terminal keystrokes that the PBX would receive and understand.

The inventive interface also could convert video output from the ASCII terminal at the PBX location into e-mail information that is directed to the remote technicians. Thus, the remotely situated technician could see the same information that would be displayed on the local ASCII terminal.

The interface has a database with profile information about the recipient and includes custom selected activation criteria for designating critical E-mail. The E-mail generator establishes communication with the recipient in accordance with the profile information. The interface also
5 has a database controller that alters the data stored in the database, particularly the profile information and the activation criteria. The interface may also be equipped with a text-to-speech converter that allows the recipient to receive the critical E-mail via direct telephone link (not shown).

10 A benefit of the invention is that a technician does not have to visit the physical site to query the machine. Thus, the technician can instigate self-test remotely. The technician can remotely view the results of a self-test. The technician can remotely view the contents of the error buffer, as well as the output from the printer. If the technician is located at a
15 warehouse, or other central facility, then the technician may be able to determine what spare parts are needed to repair the equipment, and take these parts to the equipment site, rather than requiring two visits, i.e. one to determine what spare parts are necessary and one to return with the spare parts. This would also relieve the need for the technician to have a
20 large truck, equipped with many spare parts. Thus, the technician does not have to make routine site visits, i.e. the technician would not have to visit the site until there is an actual problem.

A technical advantage of the present invention is to allow remote query and maintenance of the equipment. The invention may either be peripheral or integral with the monitored equipment. It allows maintenance personnel to query the equipment from a remote location, run/execute tests, view the results of the tests, empty the error buffer to view past problem occurrences over time, and perform other functions to try to correct and repair the equipment. The invention also allows routine maintenance type function to be remotely performed such as changing the configuration or enabling/disabling certain functionalities of the equipment.

Another technical advantage of the present invention is to send more than one message in response to the receipt of an error. Rather than sending one error message to one recipient, the invention can broadcast multiple error messages to multiple recipients. This increases the possibility of delivering the message to an available technician that can respond to the problem.

A further technical advantage of the present invention is to allow multiple users, or multiple technicians to be querying the machine and sending commands to the equipment simultaneously. With the inventive e-mail interface and an enhancement to the e-mail interpreter and generator function, multiple technicians could be allowed simultaneously access to the equipment, so that one technician doing a remote self-test and looking for failed hardware could be accessing the system at the same time as

another technician that is upgrading portions of software for switching functionality or voice mail functionality, for example.

A further technical advantage of the present invention is to provide enhanced security to access the system. The inventive interface will allow
5 for various levels of security, via encryption and authentication techniques, so that different technicians are allowed to perform different functions. This provides increased security by restricting the number of callers that can access the system and perform certain functions. Moreover, the invention can provide an alarm function by sending out e-mail messages
10 alerting the appropriate personnel of unauthorized access attempts, and disable or otherwise ignore subsequent access requests from the unauthorized individual.

The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description
15 of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and the specific embodiment disclosed may be readily utilized as a basis for modifying or designing
20 other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

5 FIGURE 1 is a schematic diagram of the inventive interface peripheral to the equipment being monitored; and

 FIGURE 2 is a schematic diagram of the inventive interface integral to the equipment being monitored.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGURE 1 shows the invention as an external device to an existing PBX or ACD or some other piece of equipment that needs to be monitored and maintained. The inventive interface device 10 is placed between the equipment 20, and the ASCII terminal 18 and the line printer 19. The device 10 is inserted into the communication lines 14, 15 running between the equipment 20 to the terminal and printer 19. The interface device 10 has two interfaces to the PBX, a line printer interface 13 which emulates a line printer to the PBX, and an ASCII terminal emulator 17 which emulates an ASCII terminal to the PBX and is able to send character keystrokes to the PBX and to receive screen information from the PBX.

The ASCII terminal emulator 17 and the line printer interface 13 are used in this case because these devices are typically used with PBX systems. The ASCII terminal emulator 17 and the line printer interface 13 could be substituted with other emulators and interfaces to satisfy the I/O requirements of the equipment 20 being monitored. This statement also applies to the ASCII interface 22 and the printer interface 23.

Also included in the interface device 10 is an e-mail interface 11, which connects the device 10 to the internet 12. The e-mail interface 11 is capable of sending and receiving standard e-mail messages used on the internet. The interface device 10 uses an e-mail interpreter and generator 16. The interpreter 16 allows information that is received at either the ASCII terminal emulator 17 or the line printer interface 13 to be converted

into an e-mail message sent to the e-mail interface 11 and is directed towards a particular internet address, which would be the technician located somewhere on the internet 12.

Similarly, the interpreter converts e-mail from the technician into data usable by the equipment. The e-mail from the technician could be system commands, requests for information, upgrade instructions, and other data used to repair, maintain, monitor, or upgrade the system. The commands or other data sent by the technician would be presented to the equipment via the ASCII terminal emulator 17, thus, the equipment respond as if the commands were entered on site at the ASCII terminal 18.

The E-mail message may be sent directly to a specific recipient or the message may be sent to an E-mail server (not shown), which would then forward the message to the recipient or select a recipient to respond to the message.

The E-mail interpreter and generator 10 receives the system messages, including error messages, from the equipment 20. If the system messages contains any of the activation criteria stored in the database 24, the E-mail interpreter and generator queries the database for each intended recipient's profile which is also stored in the database 24. The E-mail generator 10 then sends to each of the recipients an E-mail message containing the details of the system message. The database controller 25 allows technicians to update their profiles in the database 24, placing themselves on duty, taking themselves off duty, revise the current

supervisory or backup personnel, change their E-mail address or other notification criteria, as well as change the activation criteria.

Specifically, the activation criteria can be set to an alert mode, wherein only emergency system messages, such as critical error messages would be sent. The activation criteria can be set to a maintenance/repair mode where every system message, including interrupts, register contents, memory mapping, memory contents, software descriptions, configuration settings, error log contents, and any other data useful information about the status of the equipment that would be used by a technician in repairing, updating, monitoring, or performing routine maintenance on the equipment is sent via E-mail.

Also on the interface device 10 would be an ASCII terminal interface 22 which would allow information received at the ASCII terminal emulator 17 from the equipment 20 to be passed through to the terminal 18. Similarly, the interface device would have a printer interface 19 that would allow information received at the line printer interface 13 to be passed through to the printer 19. If a technician entered commands on the ASCII terminal 18, the data would be passed through the interface device 10 via the ASCII interface 22 to the ASCII terminal emulator 17 and onto the equipment 20. This would allow normal operation at the equipment site of the existing ASCII terminal 18 and printer 19 with enhanced operation of the internet interface. The interpreter could also be configured to pass command entered on the terminal 18 across the internet 12. The interface

10 could use the printer 19 to print its own history log and other information in addition to printing information sent by the equipment.

The e-mail interpreter 16 would further have functionality that allows multiple internet addresses to be addressed in special cases, such as
5 critical errors that are logged to the printer 19. These errors will be noticed by the e-mail interpreter 16 via the line printer interface 13. Operating in a broadcast mode, the e-mail interpreter 16 would mail multiple messages to multiple internet addresses 12 in an attempt to get attention immediately.

10 The preferred embodiment of the peripheral interface device 10 is a general purpose or personal computer. The computer needs to be equipped with four (4) serial ports. The first serial port would be the ASCII terminal connection that would be were the ASCII terminal emulator 17 that communicates to the equipment 20. The second serial port would be
15 the ASCII interface 22 which allows the interface 10 to pass commands and data to/from the ASCII terminal 18 and screen displays from the equipment 20 to the ASCII terminal 18. The third serial port is the line printer interface 13, that would allow the device 10 to connect to the printer output line from the equipment 20. This may be substituted with a
20 parallel port if the equipment is able to drive a printer with a parallel interface rather than a serial or RS 232 port. The fourth serial port is the printer interface 23 that connects the device 10 to the line printer 19.

The e-mail interface 11 would preferable be a 28.8 kilobyte modem, or possibly an ISDN rated modem. Currently, the most used interface to the internet is a telephone line running a 28.8kb modem. Either an
5 fifth serial port of the PC may be used. The preferred embodiment also uses a software program to perform the e-mail interpreter and generator functions, the e-mail interface functions, a line and printer interface function, and the ASCII terminal emulator functions.

FIGURE 2 shows an alternative embodiment where that the e-mail
10 interface functionality is integral to the equipment 30. Typically, a PBX or an ACD has an internal error log 32 and an internal command and control functionality 31. Normally, the command and control functionality 31 would interface to a ASCII terminal 18. The error log 32, through command and control functionality 31, would interface to the line printer
15 19. The invention would be to include an e-mail controller 33, either in hardware and/or software, to the equipment 30. The controller 33 receives information from the error log 32 via the functionality 31, and can receive and send information to the command and control functionality 31.

The e-mail controller 33 would also interface to either an internal or
20 external modem device 34 which then could be connected directly to the internet 12. This would allow the e-mail controller 33 to perform the same functionality as shown in the e-mail interpreter and generator 16 in FIGURE 1, specifically monitoring for critical errors from the error log 32

and emulating command and control actions to the command and control functionality 31 of the equipment 30 via e-mail messages in the same manner as that of the external embodiment shown in FIGURE 1.

5 The e-mail controller 33 would essentially be a card installed in the equipment system 30. The card would be compatible with the standards of the PBX, ACD or other equipment that is to be monitored. The card would include a microprocessor and software to perform the e-mail interpreting and generation functions, these functions could be embedded into ROM or stored on a disk for easier updating. The card would need to
10 be designed to conform to mechanical and electrical standards used by the equipment manufacturer.

 Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from
15 the spirit and scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. An electronic mail system that uses a global network to send e-mail to a recipient, the system comprising:

equipment located at an equipment site;

an e-mail link connecting the equipment site to the global network
5 that sends an outgoing e-mail message to the recipient across the global network and receives an incoming e-mail message from the recipient across the global network; and

an e-mail interpreter, connected between the equipment and the e-mail link, for receiving the outgoing equipment message from the
10 equipment and converting the outgoing equipment message into an outgoing e-mail message, and converting an incoming e-mail message into an incoming equipment message and sending the incoming equipment message to the equipment.

2. The system of claim 1 wherein the e-mail interpreter further comprising:

a database having profile information about the recipient and activation criteria;

5 wherein the e-mail interpreter addresses the outgoing e-mail message to the recipient in accordance with the profile information.

3. The system of claim 2 wherein:
wherein the e-mail interpreter determines whether to send the outgoing e-mail message to the recipient in accordance with the activation criteria.

4. The system of claim 3 wherein:
wherein the e-mail interpreter sends all outgoing e-mail messages to the recipient when the activation criteria is set to a repair mode.

5. The system of claim 3 wherein:
wherein the e-mail interpreter sends only emergency outgoing e-mail messages to the recipient when the activation criteria is set to an alert mode.

6. The system of claim 2 wherein the e-mail interpreter further comprising:
a database controller for altering both the profile information and the activation criteria.

7. The system of claim 1, wherein the e-mail interpreter is integral with the equipment.

8. The system of claim 1, wherein the e-mail interpreter is peripherally located to the equipment.

9. The system of claim 1 further comprising
a ASCII terminal for issuing commands to the equipment; and
a line printer for at least recording information concerning the
equipment;

5 wherein the e-mail interpreter is connected between each of the
ASCII terminal and the line printer, and the equipment.

10. The system of claim 1, wherein the equipment is a PBX
system.

11. The system of claim 1, wherein the equipment is at least one
of the following:

a security system, a safety system, a vending machine, a
photocopier, a home-type appliance, a computer, a printer, or a vehicle.

12. An electronic mail interface for connecting equipment to an e-
mail system that sends and receives messages between the equipment and
a recipient, the interface comprising:

a database having profile information about the recipient;

5 means for interpreting an outgoing equipment message from the equipment and converting the outgoing equipment message into an outgoing e-mail message;

 means for sending the outgoing e-mail message to the recipient in accordance with the profile information;

10 means for receiving an incoming e-mail message from the recipient; and

 means for interpreting the incoming e-mail message and converting the incoming e-mail message into an incoming equipment message that is presented to the equipment.

13. The interface of claim 12 wherein the database stores activation criteria:

 wherein the means for interpreting determines whether to send the outgoing e-mail message to the recipient in accordance with the activation
5 criteria.

14. The interface of claim 13 wherein:

 wherein the means for interpreting sends all outgoing e-mail messages to the recipient when the activation criteria is set to a repair mode.

15. The interface of claim 13 wherein:

wherein the means for interpreting sends only emergency outgoing e-mail messages to the recipient when the activation criteria is set to an alert mode.

16. The interface of claim 13 further comprising:

a database controller for altering both the profile information and the activation criteria.

17. The interface of claim 12, wherein the e-mail interface is integral with the equipment.

18. The interface of claim 13, wherein the e-mail interpreter is peripherally located to the equipment.

19. The interface of claim 12, wherein the equipment is a PBX system.

20. The system of claim 12, wherein the equipment is at least one of the following:

a security system, a safety system, a vending machine, a photocopier, a home-type appliance, a computer, a printer, or a vehicle.

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FIG. 1

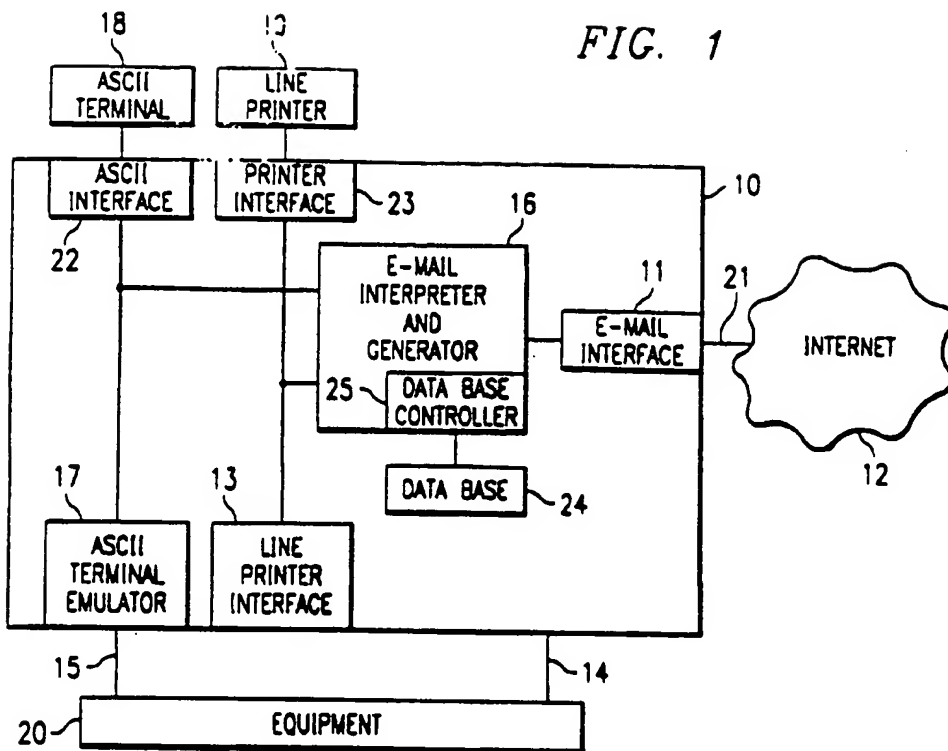


FIG. 2

